A Vision for DOE Scientific Networking Driven by High Impact Science

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Background

- Originally proposed/requested a 2-5 page whitepaper on a networking strategy for DOE
  - Extends beyond current scope of ESnet
  - One goal was better integration of network production, research, application components
- Paper presented to MICS staff on 15 March.

Vision and Approach (1/2)

- Emphasis on connection with "high impact" science
- Contains 3 network facility components
  - Production network
  - Pilot Network
  - Testbed Network
- Advanced services emphasized
- Enhanced means to introduce new network technology

Vision and Approach (2/2)

• Table 1.1 **Characteristics of the Networks** This table indicates some of the basic differences of the three networks			
• **Service Characteristic**	• **HPPN Network**	• **ASAP Network**	• **ANTCT Network**
• Bandwidth relative to current ESnet	• 4 times i.e., 2.5 Gbps	• 16 times i.e., 10 Gbps	• Defining characteristics will probably be different network architecture, protocols, etc.
• Number of sites	• 30–50	• 4–6	• Determined opportunistically
• Maturity of applications	• Full range of production applications	• Limited set of early adapter applications	• Experimental applications and application kernels
• Reliability	• 99.9%	• 95-98%	• 50-80%
• Mean time between failure	• Months	• Weeks	• Days
• Mean time to repair	• 2–4 hours	• Next business day	• Days to weeks

Example Science Drivers

- HENP
- Climate
- Data-driven Astrophysics
- Life Sciences

HPPN Goals

- High Performance Production Network
  - A high performance, science driven, production network with a targeted set of applications and facilities.
  - Increased support for end-to-end performance.
  - Directly involved science application advocates and network R&D advocates.
  - Advanced middleware services for high performance distributed applications and collaborations.
  - Broadened security focus.
  - Rich connectivity to DOE collaborators.
  - Additional focus on performance and service metrics.

ASAPN Goals

- Advanced Scientific Applications Pilot Network
  - Science driven: The ASAPN drivers are very high bandwidth, distributed science applications.
  - Integrate the development of very high performance distributed science applications with their use of the very high bandwidth networks and advanced services.
  - Decrease the time it takes to make the successes of the network-oriented R&D available to bandwidth-intensive science projects.
  - Provide sufficient stability and services to attract key scientific applications and provide science teams with reasons to use the ASAPN.
  - Establish a thriving environment for network and application innovation.
  - Driven by network R&D.
  - Driven by network security R&D
  - Driven by distributed systems middleware R&D.
  - Enhance ties to the academic and commercial communities.

ASAPN Examples

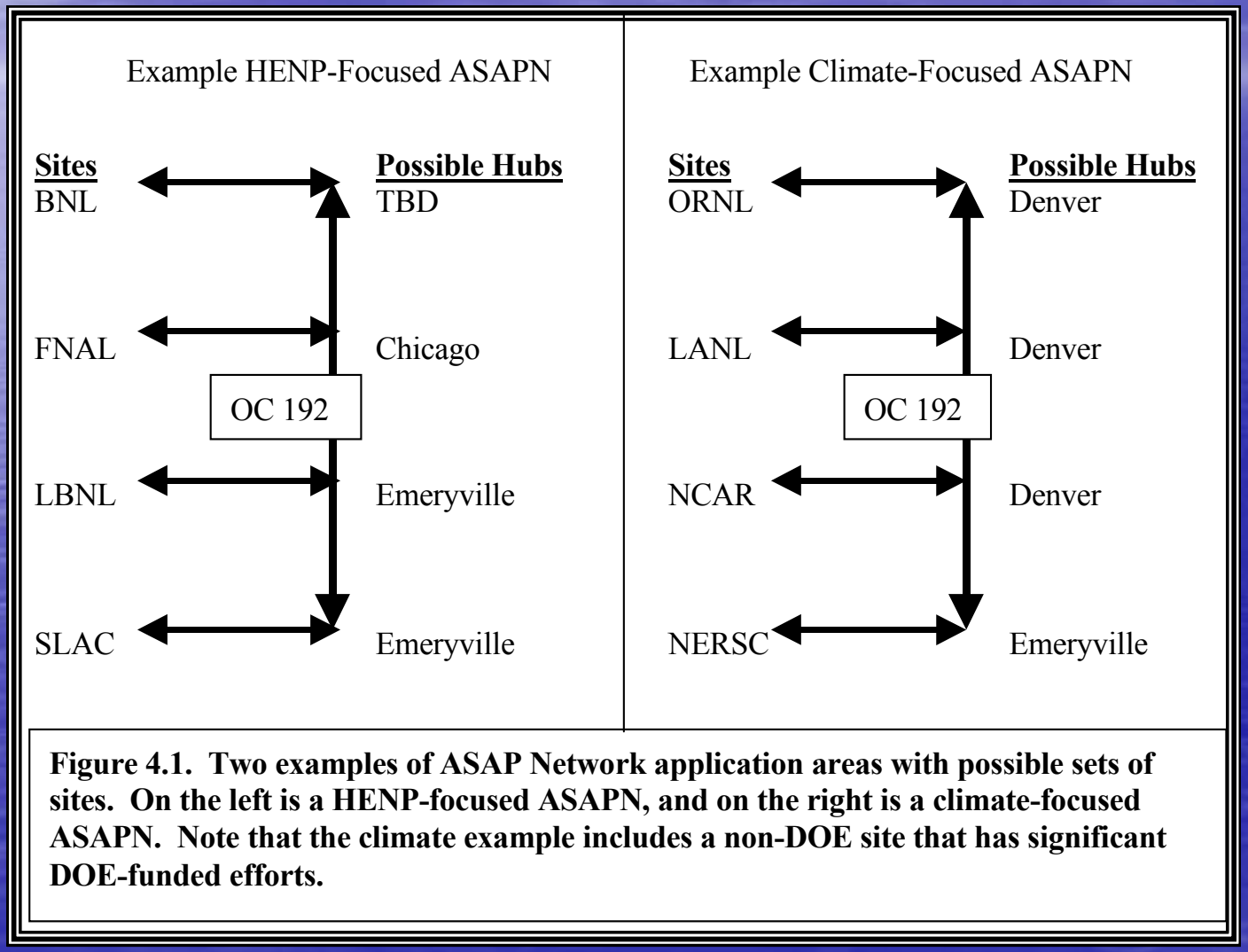

Figure 4.1. Two examples of ASAP Network application areas with possible sets of sites. On the left is a HENP-focused ASAPN, and on the right is a climate-focused ASAPN. Note that the climate example includes a non-DOE site that has significant DOE-funded efforts.

ANTCT Goals

- Advanced Network Technology Consortium Testbed
  - Explore and influence future network technology.
  - Determine how to deliver dramatic increases in current capacity and capability to next-generation science applications and facilities.
  - Work closely with the end sites in order to achieve end-to-end high bandwidth.

Annual Budgets (1/2)

- HPPN
  - Baseline $16.4M
  - OC48 Upgrade $ 1.5M
  - Additional Staffing $ 1.1M

Total $19.0M

Annual Budgets (2/2)

- ASAPN
  - Hardware (NRC) $ 6.0M
  - OC192 Access Bandwidth $ 3.0M
  - Long-haul Bandwidth $ 0.0M
  - Staffing $ 2.1M
  - Eq Refresher $ 2.0M

  Total Recurring $ 7.1M

FAQs

- Why no ANTCT budget?
- Where does the money come from?
- Does the ASAPN replace parts of the HPPN?
- Who manages the ASAPN?
- Is the HPPN really ESnet?
- Might there be a “devil in the details”?
- What happens next?

A Networking Vision for DOE

THE END